Potential Ocean Acidification Near-Term Actions

The Washington State Blue Ribbon Panel on Ocean Acidification 2012 report, ***Ocean Acidification: From Knowledge to Action, Washington State's Strategic Response*** recommended 42 Actions for addressing ocean acidification in Washington's marine waters. The Puget Sound Partnership was directed by the Governor (Executive Order 12-07) to advance implementation of the Panel's recommendations through incorporation into the Puget Sound Action Agenda. The items listed in the table provided below were identified from the Blue Ribbon Panel Actions as potential Near Term Actions (NTAs) for incorporation into the 2014 update to the Action Agenda. Over the next couple months these actions will be undergoing further review and evaluation by the Governor Inslee-appointed Marine Resource Advisory Council (MRAC), who may develop refinements and/or additional short and long-term actions necessary for addressing the Blue Ribbon Panel Recommendations. The Puget Sound Partnership will collaborate with MRAC to identify and refine NTAs for the Action Agenda that can be initiated or completed within the next 2-3 years.

STRATEGY	#	SUB-STRATEGY	NTA #	NTA	PERFORMANCE MEASURE	NTA TYPE	OWNER	SECONDARY OWNER	OWNER (3)	OWNER (4)
A	**3**	**Protect and Steward Ecologically Sensitive Rural and Resource Lands**								
A	3.2	Retain economically viable working forests and farms.		Create a forum for stakeholders to engage with resource users and managers. Provide a forum for agricultural, business, and other stakeholders to engage with state and local government, natural resource managers, and resource users to discuss the ramifications of ocean acidification and develop and implement solutions.	To be developed with input from owners.	Soundwide	Under development			
B	**2**	**Protect and restore nearshore and estuary ecosystems**								
B	2.1	Permanently protect priority nearshore physical and ecological processes and habitat, including shorelines, migratory corridors, and vegetation particularly in sensitive areas such as eelgrass beds and bluff backed beaches.		Identification of ocean acidification refuge areas. Owners will develop criteria, including chemical and physical conditions, to identify areas that could serve as refuges for native shellfish and other marine organisms susceptible to ocean acidification. Owners will use these criteria to identify and assess the refuge potential of nearshore areas, bays, and low-lying areas likely to be submerged in the future. Based on this assessment, Owners will develop a ranked recommendation of potential refuge areas, indicating areas that should be conserved, managed for future uses, and/or used for testing shellfish adaptation and remediation strategies.	To be developed with input from owners.	Soundwide	Under development			
B	2.1	Permanently protect priority nearshore physical and ecological processes and habitat, including shorelines, migratory corridors, and vegetation		Protect native seagrass and kelp. Owners will identify and protect existing native seagrass and kelp populations within Puget Sound. Owners will develop a prioritized recommendation of sites that are suitable for restoration.	To be developed with input from owners.	Soundwide	Under development			

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		particularly in sensitive areas such as eelgrass beds and bluff backed beaches.								
B	2.4	Implement a coordinated strategy to achieve the 2020 eelgrass recovery target.		Preserve Washington's existing native seagrass and kelp populations and where possible restore these populations.		Soundwide	Under development			
C	**1**	**Prevent, reduce, and control the sources of contaminants entering Puget Sound**								
C	1.3	Adopt and implement plans and control strategies to reduce pollutant releases into Puget Sound from air emissions.		Climate Action Team Recommendations. Owners will review recommendations for reducing greenhouse gas emissions from the 2008 Climate Action Team and 2012 State Energy Strategy Review. This review will include reporting progress in reducing greenhouse gas emissions for recommendations that have been or are being implemented. The review of recommendations that have not been implemented will include identification of actions that should be taken to further reduce in-state emissions of carbon dioxide and other greenhouse gasses.	To be developed with input from owners.	Soundwide	Under development			
C	**2**	**Use a comprehensive approach to manage urban stormwater runoff at the site and landscape scales**								
C	2.4	Control sources of pollutants.		Support and reinforce existing programs. Monitor the effects of existing regulatory and voluntary programs aimed at reducing pollution and improving water quality to determine what is effective and under what circumstances.	To be developed with input from owners.	Soundwide	Under development			
C	**6**	**Prevent, reduce, and/or eliminate pollution from centralized wastewater systems**								
C	6.3	Implement priority upgrades of municipal and industrial wastewater facilities		Reduce nutrient loading in South Puget Sound. Strengthen and augment existing efforts at LOTT sewage treatment plant to remove nitrogen from its effluent with increased resources and visible political support.	To be developed with input from owners.	Soundwide	Under development			
C	**7**	**Ensure abundant, healthy shellfish for ecosystem health and for commercial, subsistence, and recreational harvest consistent with ecosystem protection**								
C	7.1	Improve water quality to prevent downgrade and achieve upgrades of important current tribal, commercial and recreational shellfish harvesting areas.		Recover downgraded shellfish beds in Samish Bay. Strengthen and augment the existing Pollution Identification and Correction Program (PIC) to recover 4,000 acres of downgraded shellfish beds in Samish Bay with increased resources and visible political support.	To be developed with input from owners.	Soundwide	Under development			
C	7.1	Improve water quality to prevent downgrade and		Ensure continued water quality monitoring at the six existing shellfish hatcheries and rearing areas to enable real-time management of hatcheries under changing pH conditions.	To be developed with input from owners.	Soundwide	Under development			

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		achieve upgrades of important current tribal, commercial and recreational shellfish harvesting areas.								
C	7.1	Improve water quality to prevent downgrade and achieve upgrades of important current tribal, commercial and recreational shellfish harvesting areas.		Expand the deployment of instruments and chemical monitoring to post-hatchery shellfish facilities and farms.	To be developed with input from owners.	Soundwide	Under development			
C	7.3	Ensure environmentally responsible shellfish aquaculture based on sound science.		Investigate and develop commercial-scale water treatment methods or hatchery designs to protect larvae from corrosive seawater.	To be developed with input from owners.	Soundwide	Under development			
C	**9**	**Address and clean up cumulative water pollution impacts in Puget Sound**								
C	9.1	Complete Total Maximum Daily Load (TMDL) studies and other necessary water cleanup plans for Puget Sound to set pollution discharge limits and determine response strategies to address water quality impairments.		Ocean Acidification Technical Group. EPA will convene a technical group including Ecology, NOAA, Tribes, and academic institutions to determine the relevance of existing standards to ocean acidification. This effort will determine whether existing standards are sufficient to control impacts of local sources. If standards are determined insufficient, the Group will evaluate the applicability of other water quality criteria identified by recent research or recommended by scientific experts in the fields of ocean acidification and water quality.	To be developed with input from owners.	Soundwide	Under development			
C	9.4	Develop and implement local and tribal pollution identification and correction programs.		Expand nutrient and organic carbon reduction programs. Reduce nutrient and organic carbon inputs in locations where inputs contribute to acidification through nutrient and organic carbon reduction programs.	To be developed with input from owners.	Soundwide	Under development			
D	**1**	**Provide the leadership frameworks to guide the Puget Sound recovery effort and set action and funding priorities**								
D	1.1	Provide backbone support for the recovery effort and management conference.		Work with international, national, and regional partners to advocate for a comprehensive strategy to reduce carbon dioxide emissions.	To be developed with input from owners.	Soundwide	Under development			
D	1.1	Provide backbone		Enlist key leaders and policymakers to act as ambassadors	To be developed with input from owners.	Soundwide	Under			

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		support for the recovery effort and management conference.		advocating for carbon dioxide emissions reductions and protection of Washington's marine resources from acidification.			development			
D	**4**	**Coordinate and advance science and monitoring**								
D	4.1.1	Continue to build an accessible, peer-reviewed base of scientific knowledge about ecosystem status, effectiveness of recovery strategies and actions and ecosystem indicators provides policy-relevant information for decision makers.		Conduct laboratory studies to assess the direct effects of ocean acidification, alone and in combination with other stressors, on local species and ecosystems.	To be developed with input from owners.	Soundwide	Under development			
D	4.2	Implement a coordinated, integrated ecosystem monitoring program.		Establish the ability to make short-term forecasts of corrosive conditions for application to shellfish hatcheries, growing areas, and other areas of concern.	To be developed with input from owners.	Soundwide	Under development			
D	4.2	Implement a coordinated, integrated ecosystem monitoring program.		Establish an expanded and sustained ocean acidification monitoring network to measure trends in local acidification conditions and related biological responses.	To be developed with input from owners.	Soundwide	Under development			
D	**6**	**Build issue awareness and understanding to increase public support and engagement in recovery actions**								
D	6.1	Implement a long-term, highly visible, coordinated public-awareness effort using the Puget Sound Starts Here brand to increase public understanding of Puget Sound's health, status, and threats. Conduct regionally-scaled communications to provide a foundation for local communications		Develop communication materials about ocean acidification. PSP and partners will develop communication materials that include the following: (1) make a clear connection between ocean acidification and contributing human activities, (2) emphasize the importance of Washington's shellfish and marine resources to the regional and national economy and to the environment, and (3) share examples of local people who are being affected by ocean acidification. Communication materials would be developed in a variety of formats, distributed widely through digital and mainstream public media, and updated as needed to reflect new research.	To be developed with input from owners.	Soundwide	Under development			

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		efforts. Conduct locally-scaled communications to engage residents in local issues and recovery efforts.								
D	6.2	Incorporate and expand Puget Sound related content in diverse delivery settings (e.g. recreation, education institutions, local government, neighborhood and community groups, nonprofit organizations, businesses). Connect residents with public engagement and volunteer programs.		Increase understanding of ocean acidification. Conduct a public opinion survey and conduct outreach meetings with key stakeholders to gauge the current level of understanding of ocean acidification. Based on the findings, ocean acidification materials would be gathered, developed, and disseminated using various communication methods (e.g. website, videos, newsletter, FAQs, and social media).	To be developed with input from owners.	Soundwide	Under development			
D	6.2	Incorporate and expand Puget Sound related content in diverse delivery settings (e.g. recreation, education institutions, local government, neighborhood and community groups, nonprofit organizations, businesses). Connect residents with public engagement and volunteer programs.		Train stakeholders to conduct effective outreach. Develop a network of trained and knowledgeable speakers drawn from groups affected by acidification (e.g. shellfish growers, Tribes, fishermen). Speakers would conduct outreach to targeted audiences, focusing on a solution-oriented dialogue about how ocean acidification affects people and industry.	To be developed with input from owners.	Soundwide	Under development			
D	6.2	Incorporate and expand Puget Sound related content in diverse delivery settings (e.g. recreation, education		Leverage existing outreach networks to increase ocean acidification literacy. Provide information to existing outreach networks to educate the public about ocean acidification. Information should connect ocean acidification to local issues, showcase locally available solutions, and demonstrate how members of the public can participate.	To be developed with input from owners.	Soundwide	Under development			

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		institutions, local government, neighborhood and community groups, nonprofit organizations, businesses). Connect residents with public engagement and volunteer programs.								
The actions listed below are undergoing further review and revision with the Marine Resources Advisory Council. These actions may be included in the Action Agenda, Biennial Science Work Plan, or both.										
				Adopt legislation that will allow sewer connections in rural areas to limit nutrients entering marine waters where it is determined to be necessary based on water quality impacts.						
				If it is scientifically determined that nutrients from small and large on-site sewage systems are contributing to local acidification, require the installation of advanced treatment technologies.						
				If determined necessary based on scientific data, reduce nutrient loading and organic carbon from point source discharges.						
				Maintain and expand shellfish production to support healthy marine waters.						
				Use shells in targeted marine areas to remediate impacts of local acidification on shellfish.						
				Support restoration and conservation of native oysters.						
				Use conservation hatchery techniques to maintain the genetic diversity of native shellfish species.						
				Develop, adapt and use curricula on ocean acidification in K-12 schools and higher education.						
				Share knowledge on ocean acidification causes, consequences, and responses at state and regional symposiums, conferences, workshops, and other events.						
				Charge, by gubernatorial action, a person in the Governor's Office or an existing or new organization to coordinate implementation of the Panel's recommendations with other ocean and coastal actions.						
				Create an ocean acidification science coordination team to promote scientific collaboration across agencies and organizations and connect ocean acidification science to policy and program needs.						
				Review data to determine if there is a causal relationship between local air emissions and local marine water acidity. If the data confirms such a relationship, take actions to reduce local air						

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				emissions that contribute to acidification.						
				Develop vegetation-based systems of remediation for use in uplands and in shellfish areas.						
				Develop and incorporate acidification indicators and thresholds to guide adaptive action for species and places.						
				Investigate genetic mechanisms and selective breeding approaches for acidification tolerance in shellfish and other vulnerable marine species.						
				Develop predictive relationships for indicators of ocean acidification (pH and aragonite saturation state).						
				Support development of new technologies for monitoring ocean acidification.						
				Quantify key natural and human-influenced processes that contribute to acidification based on estimates of sources, sinks, and transfer rates for carbon and nitrogen.						
				Develop new models or refine existing models to include biogeochemical processes of importance to ocean acidification.						
				Determine the association between water and sediment chemistry and shellfish production in hatcheries and in the natural environment.						
				Conduct field studies to characterize the effects of ocean acidification, alone and in combination with other stressors, on local species.						
				Enhance the ability to predict the long-term future status of carbon chemistry and pH in Washington's waters and create models to project ecological responses to predicted ocean acidification conditions.						
				Enhance the ability to model the response of organisms and populations to ocean acidification to improve our understanding of biological responses.						